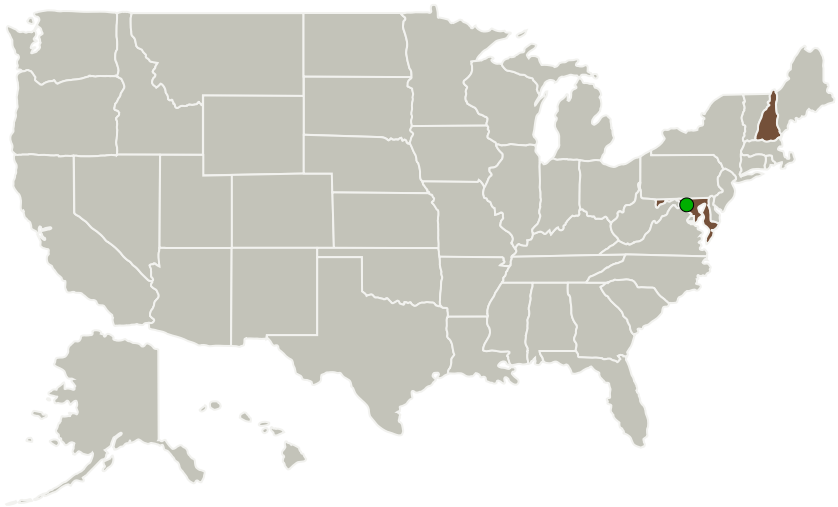
Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase II

Completed Technology Project (2017 - 2019)

Project Introduction

Earth observing missions like NASA's LANDSAT Data Continuity Mission - Thermal Infrared Sensor (LDCM-TIRS) require greater spatial resolution of the earth than the ~ 100m provided by the current instrument. Improving resolution to the desired ~ 30m requires increasing the number of pixels on target from the current 640x3 to ~ 2048x3. The TIRS instrument contains 640x512 longwave infrared quantum well infrared photodetector focal plane arrays (LWIR QWIP FPAs) jointly developed by NASA/GSFC and QmagiQ. QmagiQ proposes to achieve the higher pixel resolution while simultaneously improving quantum efficiency and operating temperature by using antimony-based strained layer superlattice (SLS) detectors. A key challenge is dealing with the effects of reducing pixel pitch from 25 microns down to ~ 10 microns, viz. optical fill-factor, optical crosstalk, processing difficulties, pixel operability, etc. As a stepping stone in Phase I, we developed and delivered an SLS FPA with 1280x1024 format on 12 micron pitch that achieved record performance, viz. > 40% quantum efficiency and dark current half of MCT Rule07 for FPAs with cutoff wavelength > 11 microns. In Phase II, we will increase FPA format to 2048x2048 and push cutoff wavelength to 12-13 microns while still hitting desired quantum efficiency and operating temperature targets in consultation with NASA/GSFC. Several FPAs will be delivered to NASA for evaluation.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
QmagiQ, LLC	Lead Organization	Industry	Nashua, New Hampshire
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Maryland	New Hampshire

Project Transitions

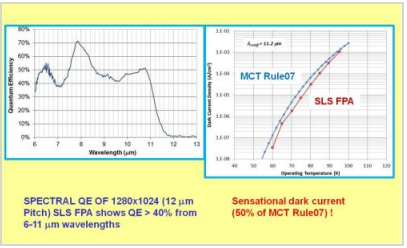
April 2017: Project Start

April 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140908)*

Images



Briefing Chart Image
Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase II Briefing Chart Image *(https://techport.nasa.gov/image/135140)*

Final Summary Chart Image
Megapixel Longwave Infrared SLS FPAs for High Spatial Resolution Earth Observing Missions, Phase II *(https://techport.nasa.gov/image/135515)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
QmagiQ, LLC

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

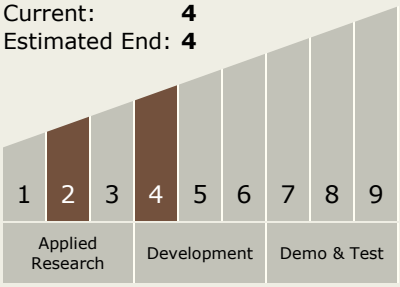
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Mani Sundaram

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.1 Field and Particle Detectors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System